

## CLAIMS

What is claimed is:

1. A method of treating a subterranean formation penetrated by a well, the method  
2 comprising the steps of:
  - 3 (a) forming a treatment fluid comprising:
    - 4 1) water;
    - 5 2) a water-soluble polysaccharide capable of increasing the viscosity of the  
6 water and present in a sufficient concentration to increase the viscosity of  
7 the water; and
    - 8 3) a breaker comprising at least one member selected from the group  
9 consisting of a source of chlorite ions and a source of hypochlorite ions,  
10 wherein the breaker is present in a sufficient concentration to break the  
11 viscosity of the treatment fluid after introduction of the fluid into the  
12 subterranean formation;
  - 13 (b) at any stage of forming the treatment fluid, adding a breaker moderator  
14 comprising at least one member selected from the group consisting of a source of  
15 magnesium ions and a source of calcium ions to provide a sufficient concentration of the  
16 breaker moderator to control the break rate of the fluid; and
  - 17 (c) introducing the treatment fluid into the well and into contact with the  
18 formation.

1       2. A method of treating a subterranean formation penetrated by a well, the method  
2 comprising the steps of:  
3           (a) forming a treatment fluid, comprising:  
4               1) water;  
5               2) a water-soluble polysaccharide and a crosslinking agent for the water-  
6               soluble polysaccharide, which are present in a sufficient concentration to  
7               effect crosslinking of the polysaccharide and increase the viscosity  
8               of the water;  
9               3) a breaker comprising at least one member selected from the group  
10               consisting of a source of chlorite ions and a source of hypochlorite ions,  
11               wherein the breaker is present in a sufficient concentration to break the  
12               viscosity of the treatment fluid after introduction of the fluid into the  
13               subterranean formation; and  
14               4) a breaker moderator comprising at least one member selected from the  
15               group consisting of a source of magnesium ions and a source of calcium  
16               ions, wherein the breaker moderator is present in a sufficient concentration  
17               to control the break rate of the fluid; and  
18               (b) introducing the treatment fluid into the well and into contact with the  
19               formation.

1       3. The method of Claims 1 or 2, wherein the formation has a static temperature of  
2       200°F and above.

1       4. The method of Claim 3, wherein the formation has a static temperature of up to  
2       350°F.

1       5. The method of Claims 1 or 2, wherein the step of introducing the treatment fluid  
2       into the well and into contact with the formation is at a rate and pressure sufficient to  
3       fracture the formation.

1       6. The method of Claims 4, wherein the step of introducing the treatment fluid into  
2       the well and into contact with the formation is at a rate and pressure sufficient to  
3       fracture the formation.

1       7. The method of Claim 6, wherein the treatment fluid further comprises a proppant.

1       8. The method of Claim 4, wherein the treatment fluid is adapted to break within 1  
2       to 24 hours after being introduced into the well and into contact with the formation.

1       9. The method of Claim 4, wherein the polysaccharide comprises at least one  
2       member selected from the group consisting of galactomannans, modified or  
3       derivatized galactomannans, and cellulose derivatives.

1       10. The method of Claims 4, wherein the polysaccharide comprises at least one  
2       member selected from the group consisting of guar, hydroxypropylguar,  
3       carboxymethylhydroxypropylguar, carboxymethylhydroxyethylcellulose,  
4       carboxymethylcellulose, and hydroxyethylcellulose grafted with vinylphosphonic  
5       acid.

1       11. The method of Claim 2, wherein the crosslinking agent comprises at least one  
2       member selected from the group consisting of borate-releasing compounds, a source  
3       of titanium ions, a source of zirconium ions, a source of antimony ions, and a source  
4       of aluminum ions.

1       12. The method of Claim 11, wherein the borate releasing compound comprises  
2       ulexite.

1       13. The method of Claims 1 or 2, wherein the breaker comprises at least one member  
2       selected from the group consisting of alkali metal chlorites.

- 1 14. The method of Claim 6, wherein the breaker comprises at least one member
- 2 selected from the group consisting of alkali metal chlorites.
- 1 15. The method of Claim 14, wherein the breaker comprises sodium chlorite.
- 1 16. The method of Claims 1 or 2, wherein the breaker moderator comprises at least
- 2 one member selected from the group consisting of a source of magnesium ions.
- 1 17. The method of Claim 6, wherein the breaker moderator comprises at least one
- 2 member selected from the group consisting of a source of magnesium ions.
- 1 18. The method of Claim 14, wherein the breaker moderator comprises at least one
- 2 member selected from the group consisting of a source of magnesium ions.
- 1 19. The method of Claim 18, wherein the breaker moderator comprises at least one
- 2 member selected from the group consisting of magnesium chloride, magnesium
- 3 acetate, and magnesium sulfate.
- 1 20. The method of Claims 1 or 2, wherein the breaker moderator comprises at least
- 2 one member selected from the group consisting of: calcium chloride, calcium acetate,
- 3 and calcium nitrate.
- 1 21. The method of Claim 14, wherein the breaker moderator comprises at least one
- 2 member selected from the group consisting of: calcium chloride, calcium acetate, and
- 3 calcium nitrate.
- 1 22. The method of Claims 1 or 2, wherein the fluid further comprises a pH adjusting
- 2 agent present in a sufficient concentration to adjust the pH of the fluid to be at least
- 3 10.

1        23. The method of Claim 14, wherein the fluid further comprises a pH adjusting agent  
2        present in a sufficient concentration to adjust the pH of the fluid to be at least 10.

1        24. A treatment fluid for treating a subterranean formation penetrated by a well, the  
2        fluid comprising:

- 3        (a)      water;
- 4        (b)      a water-soluble polysaccharide capable of increasing the viscosity of the  
5        water and present in a sufficient concentration to increase the viscosity of the water;
- 6        (c)      a breaker comprising at least one member selected from the group  
7        consisting of a source of chlorite ions and a source of hypochlorite ions, wherein the  
8        breaker is present in a sufficient concentration to break the treatment fluid after  
9        introduction of the fluid into the subterranean formation; and
- 10       (d)      a breaker moderator comprising at least one member selected from the  
11       group consisting of a source of magnesium ions and a source of calcium ions,  
12       wherein the breaker moderator is present in a sufficient concentration to control the  
13       break rate of the fluid, and wherein at least part of the concentration of the breaker  
14       moderator is added to the fluid.

1       25. A treatment fluid for treating a subterranean formation penetrated by a well, the  
2       fluid comprising:

3           (a) water;

4           (b) a water-soluble polysaccharide and a crosslinking agent for the water-soluble  
5       polysaccharide, which are present in a sufficient concentration to effect crosslinking  
6       of the polysaccharide and increase the viscosity of the water;

7           (c) a breaker comprising at least one member selected from the group consisting  
8       of a source of chlorite ions and a source of hypochlorite ions, wherein the breaker is  
9       present in a sufficient concentration to break the viscosity of the treatment fluid after  
10      introduction of the fluid into the subterranean formation; and

11           (d) a breaker moderator comprising at least one member selected from the group  
12       consisting of a source of magnesium ions and a source of calcium ions, wherein the  
13       breaker moderator is present in a sufficient concentration to control the break rate of  
14       the fluid, and wherein at least part of the concentration of the breaker moderator is  
15       added to the fluid.

1       26. The treatment fluid of Claims 24 or 25, wherein the treatment fluid breaks within  
2       6 to 24 hours for at least one temperature in the range of 200°F to 350°F.

1       27. The treatment fluid of Claim 26, wherein the treatment fluid further comprises a  
2       proppant.

1       28. The treatment fluid of Claim 26, wherein the polysaccharide comprises at least  
2       one member selected from the group consisting of galactomannans, modified or  
3       derivatized galactomannans, and cellulose derivatives.

1       29. The treatment fluid of Claim 26, wherein the polysaccharide comprises at least  
2       one member selected from the group consisting of guar, hydroxypropylguar,  
3       carboxymethylhydroxypropylguar, carboxymethylhydroxyethylcellulose,  
4       carboxymethylcellulose, and hydroxyethylcellulose grafted with vinyl phosphonic  
5       acid.

1       30. The treatment fluid of Claim 26, wherein the crosslinking agent comprises at least  
2       one member selected from the group consisting of borate-releasing compounds, a  
3       source of titanium ions, a source of zirconium ions, a source of antimony ions, and a  
4       source of aluminum ions.

1       31. The treatment fluid of Claims 30, wherein the borate releasing compound  
2       comprises ulexite.

1       32. The treatment fluid of Claims 24 or 25, wherein the breaker comprises at least  
2       one member selected from the group consisting of alkali metal chlorites.

1       33. The treatment fluid of Claim 26, wherein the breaker comprises at least one  
2       member selected from the group consisting of alkali metal chlorites.

1       34. The treatment fluid of Claim 33, wherein the breaker comprises sodium chlorite.

1       35. The treatment fluid of Claims 24 or 25, wherein the breaker moderator comprises  
2       at least one member selected from the group consisting of a source of magnesium  
3       ions.

1       36. The treatment fluid of Claim 33, wherein the breaker moderator comprises at least  
2       one member selected from the group consisting of a source of magnesium ions.

1       37. The treatment fluid of Claim 24 or 25, wherein the breaker moderator comprises  
2       at least one member selected from the group consisting of magnesium chloride,  
3       magnesium acetate, and magnesium sulfate.

1       38. The treatment fluid of Claim 26, wherein the breaker moderator comprises at least  
2       one member selected from the group consisting of magnesium chloride, magnesium  
3       acetate, and magnesium sulfate.

1       39. The treatment fluid of Claim 24 or 25, wherein the breaker moderator comprises  
2       at least one member selected from the group consisting of: calcium chloride, calcium  
3       acetate, and calcium nitrate.

1       40. The treatment fluid of Claim 33, wherein the breaker moderator comprises at least  
2       one member selected from the group consisting of: calcium chloride, calcium acetate,  
3       and calcium nitrate.

1       41. The treatment fluid of Claims 24 or 25, wherein the fluid further comprises a pH  
2       adjusting agent present in a sufficient concentration to adjust the pH of the fluid to be  
3       at least 10.

1       42. The treatment fluid of Claim 33, wherein the fluid further comprises a pH  
2       adjusting agent present in a sufficient concentration to adjust the pH of the fluid to be  
3       at least 10.

1       43. The treatment fluid of Claims 24 or 25, wherein part of the concentration of the  
2       breaker moderator is naturally occurring in the water.

1       44. The treatment fluid of Claims 24 or 25, wherein the concentration of the breaker  
2       moderator is at least about 15 mg/L.

1       45. A method of treating a subterranean formation penetrated by a well, the method  
2       comprising the steps of:

3           (a) forming a treatment fluid comprising:

4            1) water,  
5            2) a water-soluble polysaccharide capable of increasing the viscosity of the  
6            water and present in a sufficient concentration to increase the viscosity of  
7            the water; and  
8            3) a breaker comprising at least one member selected from the group  
9            consisting of a source of chlorite ions and a source of hypochlorite ions,  
10           wherein the breaker is present in a sufficient concentration to break the  
11           viscosity of the treatment fluid after introduction of the fluid into the  
12           subterranean formation;

13           (b) selecting the water for naturally including a breaker modifier comprising  
14           at least one member selected from the group consisting of a source of magnesium ions  
15           and a source of calcium ions, where the breaker modifier is present in a sufficient  
16           concentration to control the break rate of the treatment fluid; and  
17           (c) introducing the treatment fluid into the well and into contact with the  
18           formation.

1       46. A method of treating a subterranean formation penetrated by a well, the method  
2       comprising the steps of:

3       (a) forming a treatment fluid comprising:

4           1) water;

5           2) a water-soluble polysaccharide capable of increasing the viscosity of the  
6           water and present in a sufficient concentration to increase the viscosity of  
7           the water; and

8           3) a breaker comprising at least one member selected from the group  
9           consisting of a source of chlorite ions and a source of hypochlorite ions,  
10           wherein the breaker is present in a sufficient concentration to break the  
11           viscosity of the treatment fluid after introduction of the fluid into the  
12           subterranean formation;

13           (b) at any stage of forming the treatment fluid, adding at least one member

14           selected from the group consisting of a source of magnesium ions and a source of  
15           calcium ions to provide at total ionic concentration of at least about 15 mg/L; and

16           (c) introducing the treatment fluid into the well and into contact with the  
17           formation.